



US009151128B2

(12) **United States Patent**
Le Briere et al.

(10) **Patent No.:** **US 9,151,128 B2**
(45) **Date of Patent:** **Oct. 6, 2015**

(54) **DEVICE FOR INTERVENTION IN A FLUID
EXPLOITATION WELL, EXPLOITATION
INSTALLATION AND ASSOCIATED METHOD**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 1038 days.

(21) Appl. No.: **13/260,732**

(22) PCT Filed: **Apr. 1, 2010**

(86) PCT No.: **PCT/FR2010/050624**

§ 371 (c)(1),
(2), (4) Date: **Feb. 3, 2012**

(87) PCT Pub. No.: **WO2010/112779**

PCT Pub. Date: **Oct. 7, 2010**

(65) **Prior Publication Data**

US 2012/0125638 A1 May 24, 2012

(30) **Foreign Application Priority Data**

Apr. 2, 2009 (FR) 09 52130

(51) **Int. Cl.**

E21B 44/06 (2006.01)
E21B 23/14 (2006.01)

(Continued)

(52) **U.S. Cl.**

CPC . **E21B 23/14** (2013.01); **B66D 1/44** (2013.01);
F04B 47/04 (2013.01)

(58) **Field of Classification Search**

CPC E21B 44/06; E21B 44/02; E21B 21/08;
E21B 34/16; E21B 19/165; E21B 7/022

USPC 175/27
See application file for complete search history.

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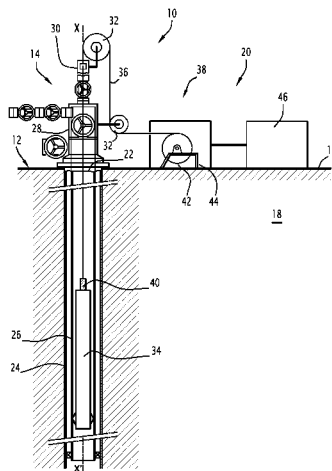
(57) **ABSTRACT**

This device comprises a cable working line bearing a lower
assembly and a winch for maneuvering the line.

The hydraulic central unit (46) of the winch includes a tank
(50) for storing a hydraulic control fluid, a pump (52) for
driving the hydraulic fluid, connected to the tank (50) through
an upstream conduit (54) and at least one hydraulic motor
(56) for driving the drum (42) connected to the pump (52)
through an intermediate conduit and connected to the tank
(50) through a downstream conduit.

The hydraulic central unit comprises a regulator (62) for the
hydraulic fluid flow rate at the outlet of the pump (52). The
regulator (62) is driven according to at least one hydraulic
fluid pressure depending on the load exerted on the motor (56)
by the rotary drum (42), said or each pressure being directly
taken on one of said conduits.

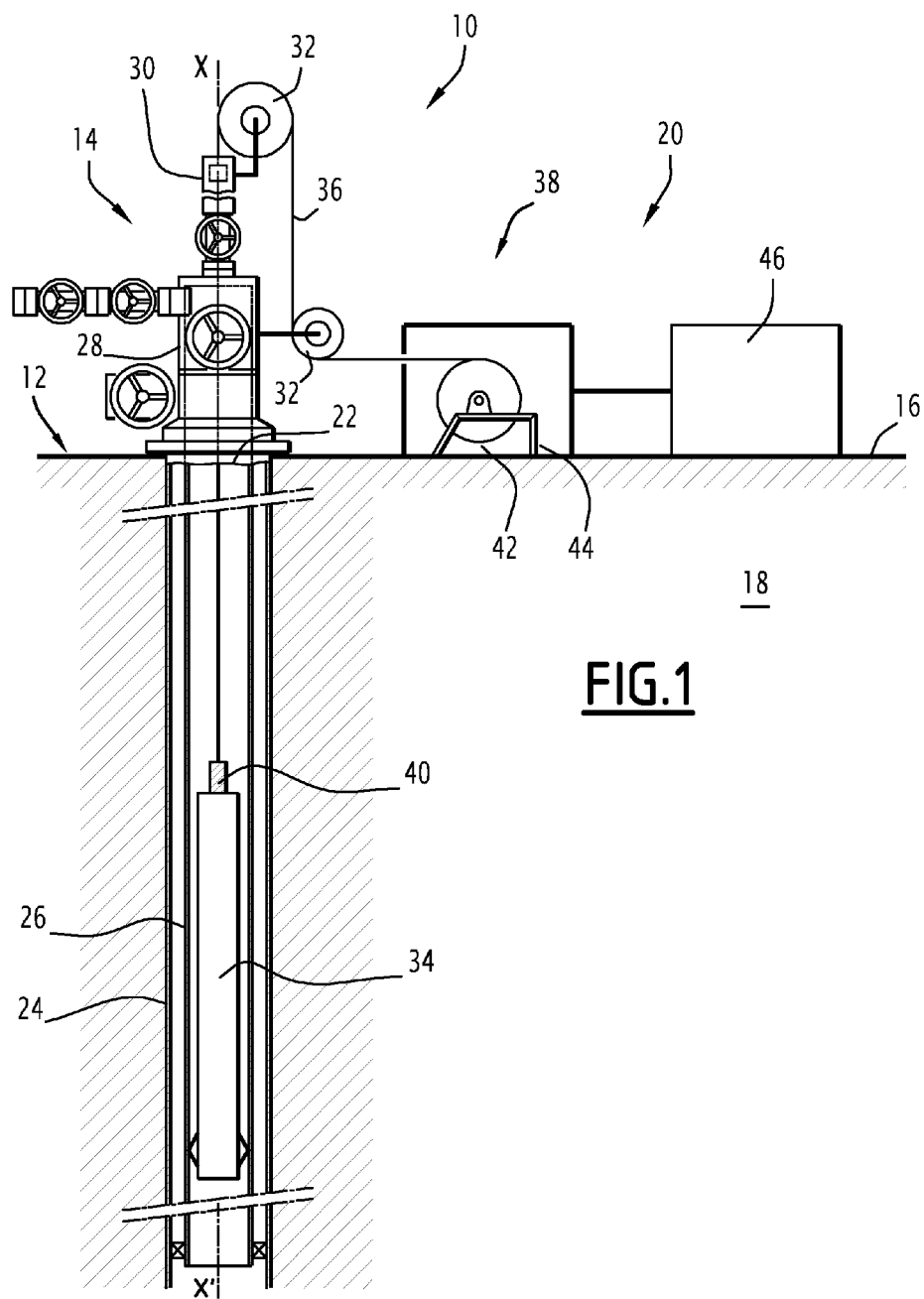
8 Claims, 6 Drawing Sheets



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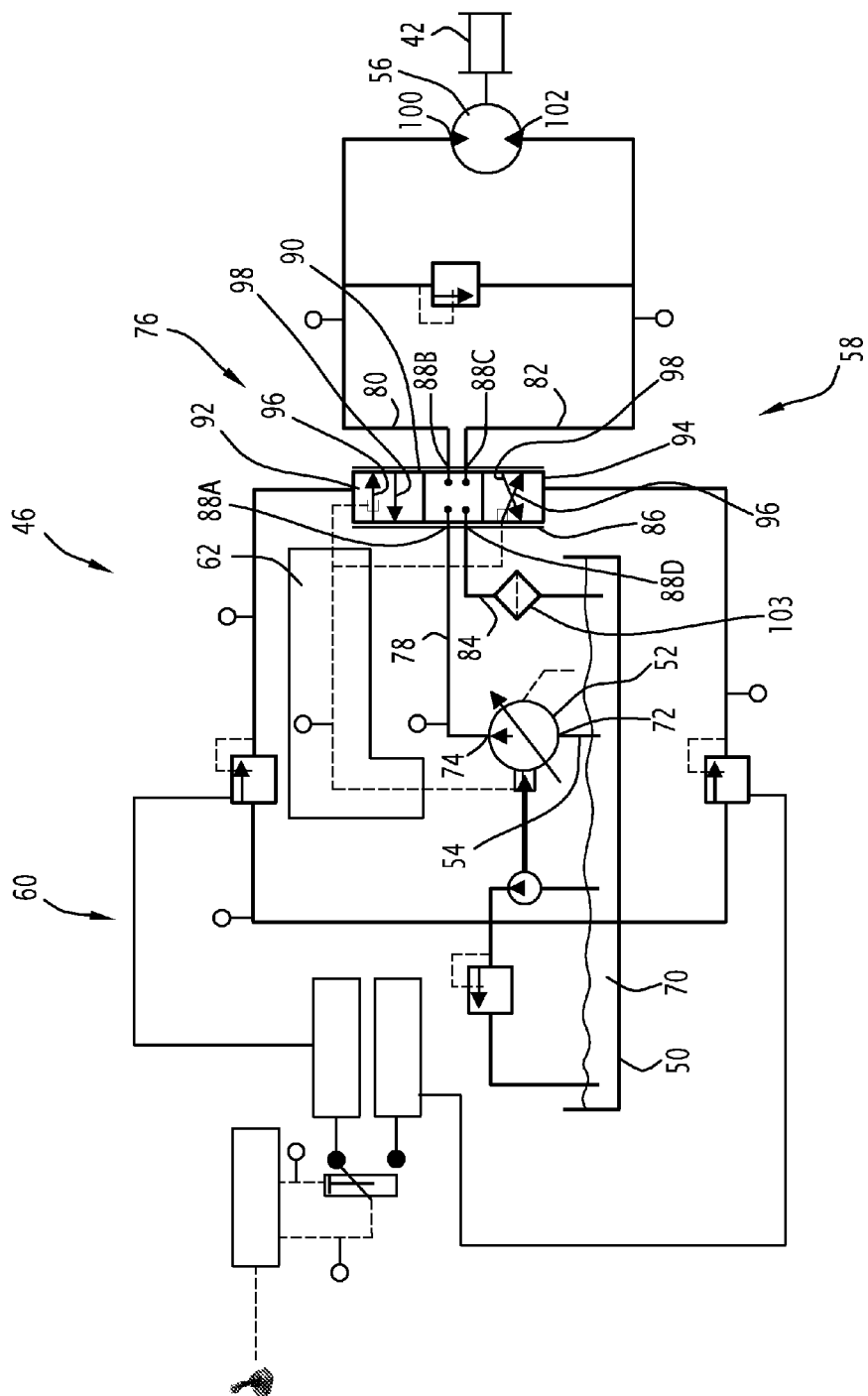


FIG. 2

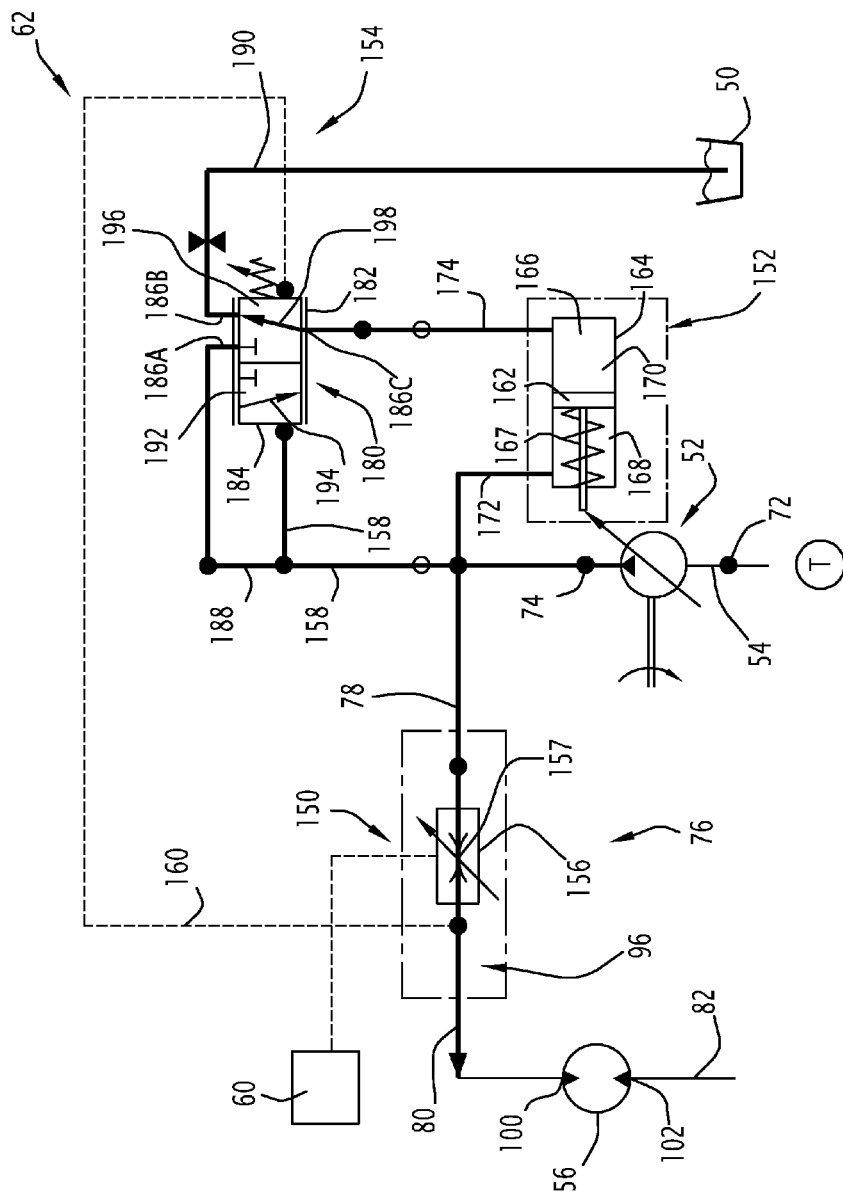
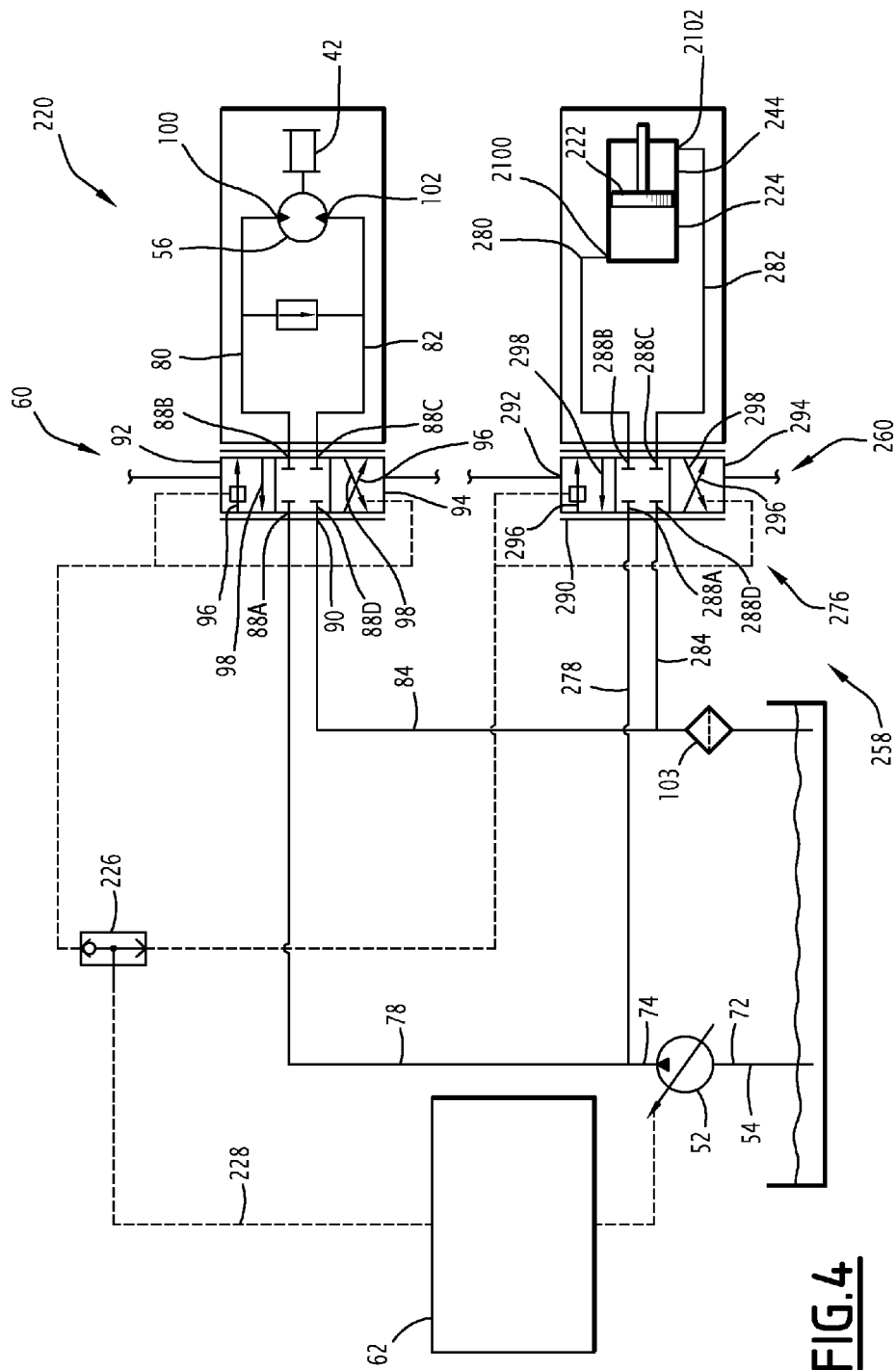


FIG. 3



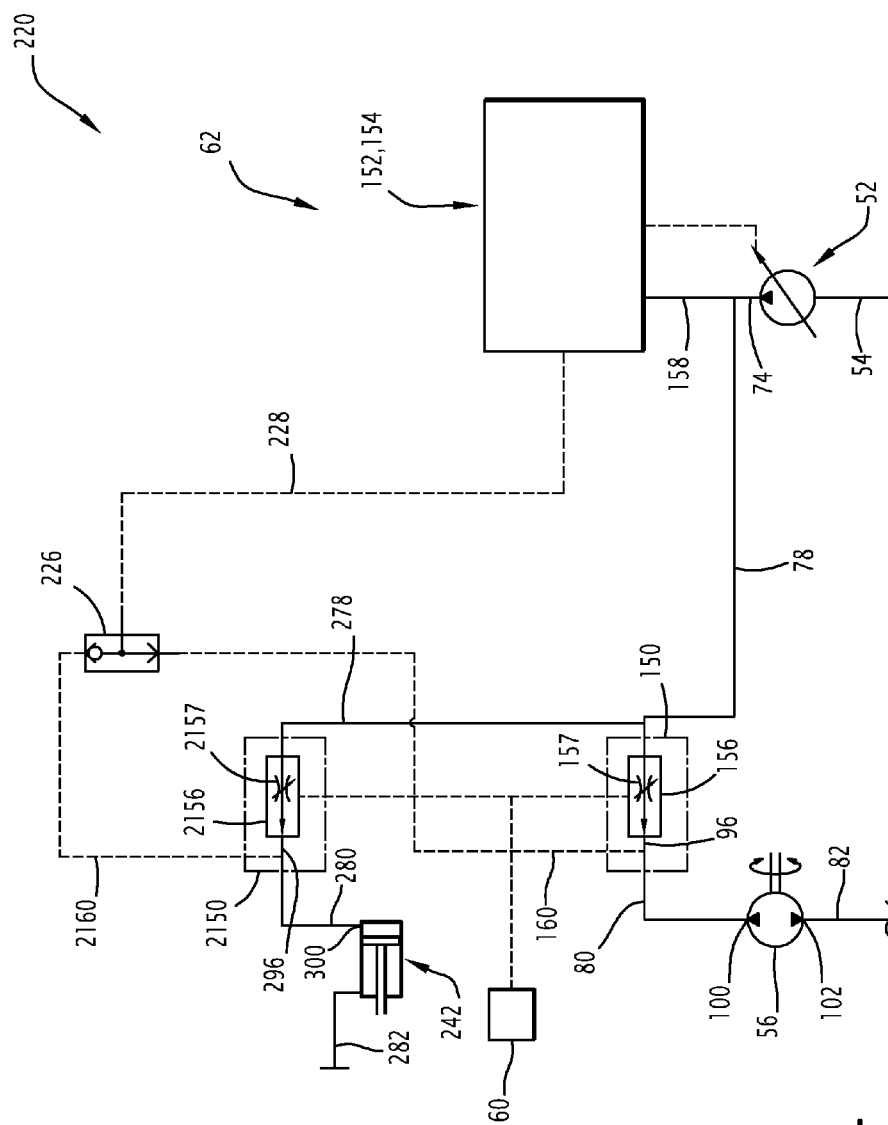


FIG. 5

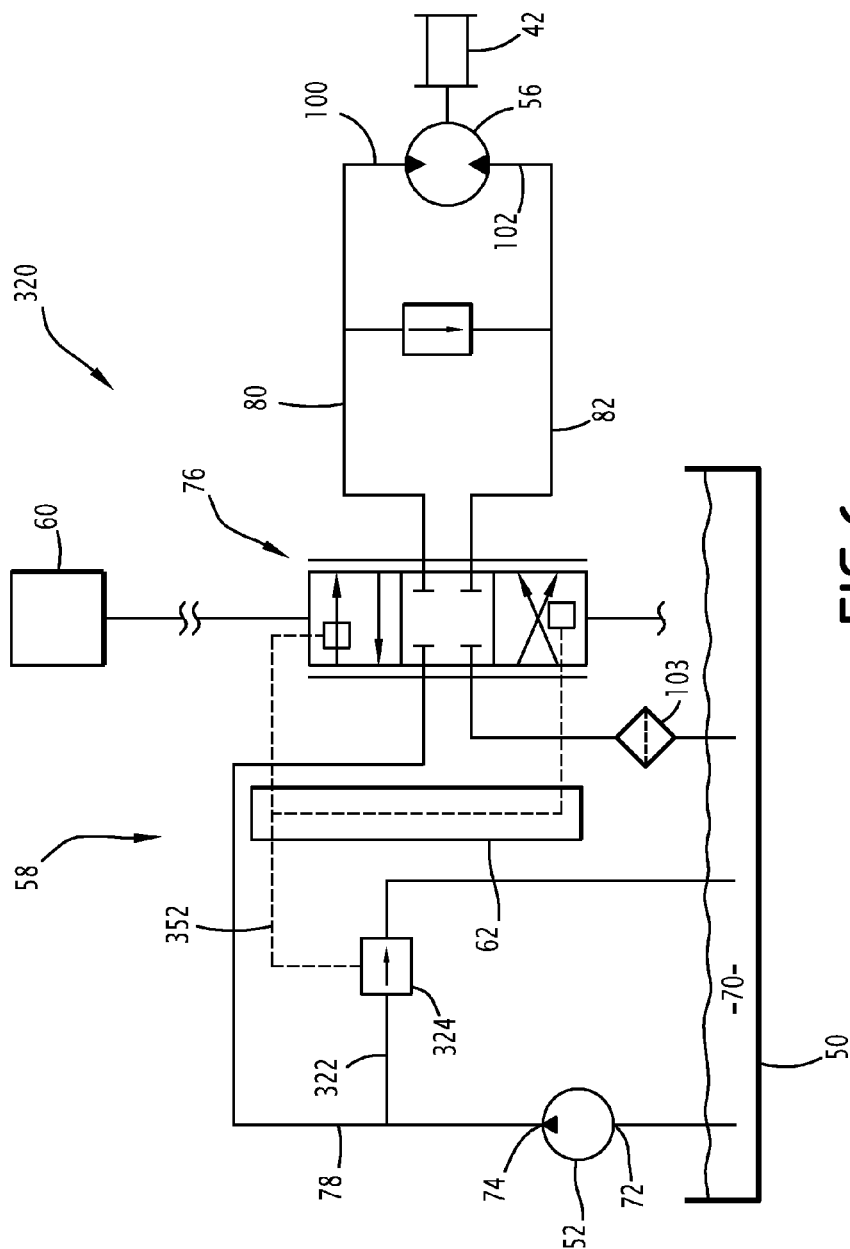


FIG. 6

DEVICE FOR INTERVENTION IN A FLUID EXPLOITATION WELL, EXPLOITATION INSTALLATION AND ASSOCIATED METHOD

The present invention relates to a device for intervention in a fluid exploitation well, of the type comprising:

- a lower assembly bearing at least one intervention and/or measurement tool, intended to be introduced into the well;
- a cable working line bearing the lower assembly;
- a winch for maneuvering the line, the winch comprising a rotary drum for winding up the line and a hydraulic central unit for driving the drum into rotation, the hydraulic central unit including:
- a tank for storing a hydraulic control fluid;
- a pump for driving the hydraulic fluid contained in the tank, connected to the tank through an upstream conduit;
- at least one hydraulic motor for driving the drum connected to the pump through an intermediate conduit and connected to the tank through a downstream conduit.

The invention notably applies to operations which have to be carried out in the well by means of tools attached to the lower assembly. These operations are for example the opening and closing of valves, the breaking of shear pins, the production of perforations, the setting-up and removal of tools in the well, or the fishing-out of tools blocked in the well (for example laying and withdrawing anchor mandrels).

In order to perform this type of operations, the tool is mounted on the free end of a cable working line which may notably be a smooth single-strand cable of the "piano wire" or "slick line" but also a stranded cable, a so called "braided line" or "electric line". These cables are generally in steel but may be coated or in a composite material. In order to unwind the cable working line, the use of a winch is known, which is brought to the vicinity of the well, and which is maneuvered in rotation in order to wind and unwind the cable in the well.

For this purpose, known winches generally comprise a drum on which the cable working line is wound, and a hydraulic central unit for driving the drum into rotation.

The hydraulic central unit is in most cases of the "open loop" type. This type of central unit comprises a storage tank containing a large amount of hydraulic fluid, a hydraulic conduit having two ends immersed in the tank, a pump and a motor mounted in series on the hydraulic conduit.

An adjustable bypass connects the outlet of the pump upstream from the motor to the tank.

This type of central unit operates by actuating the pump so that it permanently delivers a maximum flow of fluid and by selectively diverting a selected amount of hydraulic fluid through the bypass depending on the load and on the required speed on the motor.

Such central units are therefore very reactive in particular when a significant load has to be exerted on the cable working line, or when a high speed or high acceleration has to be obtained very rapidly. However, these central units consume a lot of energy and are not very performing when the displacement of the cable working line is slow, notably for recording logs or "logging" in the well. The design of the currently used bypasses, with a valve with directional control, is very robust since it is possible to pass from zero flow rate to maximum flow rate, within a fraction of a second. This design is however very unstable with the pressure change in the circuit induced by variations of the load, notably on the cable tension. The result of this is instability on the flow rate and therefore on the speed which may be a problem for a logging operation. From an ergonomic point of view, the use of this type of hydraulic circuit is also difficult for the operator since it requires simul-

taneous handling of the bypass valve and of the brake during jarring with a jar or more generally of the bypass valve and of the pressure control.

In order to overcome all these problems, closed loop hydraulic central units have also been used. This type of central unit is equipped with a hydraulic tank with reduced volume. The cylinder capacity of the pump is adjustable manually and the outlets of the pump are directly connected to the inlets of the motor.

Closed loop central units allow more accurate adjustment of the deployment speed notably at a slow speed (10 m/min is the normal speed for a logging operation), and limitation of the energy consumption since the pump is only powered according to the required speed.

However, they have the drawback of not being sufficiently reactive when a high acceleration has to be obtained rapidly upon moving upwards or downwards. Further, if several systems are simultaneously powered in the vicinity of the well, such as for example a winch and a generator, a hydraulic supply pump is required for each system, which increases maintenance costs and the complexity of the hydraulic circuit.

An object of the invention is therefore to obtain a device for intervention in a well which is very reactive, while consuming little energy and having good accuracy and stability at low speeds regardless of the load.

For this purpose, the object of the invention is a intervention device of the aforementioned type, characterized in that the hydraulic central unit comprises a regulator for the flow of hydraulic fluid delivered to said or each hydraulic motor, the regulator being driven according to at least one hydraulic fluid pressure depending on the load exerted on the motor by the rotary drum, said or each pressure being directly taken on one of said conduits.

The device according to the invention may comprise one or more of the following features, taken individually or according to any technically possible combination(s):

- the hydraulic central unit comprises an adjustable calibrated throttle, mounted on the intermediate conduit, an upstream tap and a downstream tap for taking the pressure upstream and downstream from the throttle, the regulator being servo-controlled in order to maintain the pressure difference taken between the upstream and downstream taps, substantially constant at an adjustable threshold value;

- the regulator comprises an assembly for adjusting the flow rate of the pump including a mobile member between a minimum flow rate position and a maximum flow rate position,

- the regulator comprising an assembly for servo-control of the mobile member including a control valve having a displaceable slide between a first control position for displacing the mobile member towards the maximum flow rate position and a second control position for displacing the mobile member towards the minimum flow rate position, the upstream tap and the downstream tap being hydraulically connected to the control valve in order to displace the slide between its control positions depending on the pressure difference between the upstream tap and the downstream tap;

- the adjustment assembly comprises an enclosure delimiting a chamber for receiving the mobile member, the mobile member defining in the chamber an upstream region hydraulically connected to one of said conduits and a downstream region hydraulically connected to the control valve, the slide in its first position being connected to the downstream region, in order to supply the

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downstream region with pressurized hydraulic fluid, and a second position hydraulically connecting the downstream region to a low pressure tank;

the device comprises a bypass tubing connecting the outlet of the pump to the tank, the regulator comprising a valve for controlling the flow circulating through the bypass tubing;

the hydraulic central unit comprises a switching valve which may be displaced between a first activation position in which the intermediate conduit is formed between the outlet of the pump and a first inlet of the motor, and the downstream conduit is formed between a second inlet of the motor and the tank, and a second activation position in which the intermediate conduit is formed between the second inlet of the motor and the outlet of the pump and the downstream conduit connects the first inlet of the motor and the tank;

the calibrated throttle is placed in the switching valve; and the hydraulic central unit comprises a hydraulically driven member, connected to the pump in parallel on the hydraulic motor.

This type of device is compatible in terms of performances with all the useful applications on the proven oil land: log recordings ("logging"), mechanical work with the standard cable, fishing-out, jar hammering, pistoning in the well. It gives the possibility, without complicating the hydraulic circuit, of associating a certain number of hydraulic accessories therewith.

The object of the invention is further an installation for exploiting fluid, characterized in that it comprises:

an exploitation well made in the ground, the well opening out at a first point located at the surface of the ground; a well head, obturating the well at the first point; and an intervention device as defined above, the lower assembly and the working line being introduced into the well through the well head.

The object of the invention is also a method for intervention in an exploitation well, characterized in that comprises the following steps:

mounting the lower assembly on the working line and introducing the lower assembly and the working line into the well;

actuating the hydraulic central unit in order to drive the drum into rotation, the actuation comprising:

applying the pump for driving the hydraulic motor by circulating hydraulic fluid in said conduits, and regulating the delivered flow to said or to each hydraulic motor according to at least one pressure depending on the load exerted on the motor by the drum, said or each pressure being directly taken on one of said conduits.

The invention will be better understood upon reading the description which follows, only given as an example, and made with reference to the appended drawings wherein:

FIG. 1 is a schematic partial sectional view along a median vertical plane of a first fluid exploitation installation comprising an intervention device according to the invention;

FIG. 2 is a simplified hydraulic diagram of the hydraulic central unit for driving the winch in the intervention device of FIG. 1;

FIG. 3 is a simplified hydraulic diagram of the flow rate controller of the hydraulic central unit of FIG. 2;

FIG. 4 is a view analogous to FIG. 2 of a second intervention device according to the invention;

FIG. 5 is a view analogous to FIG. 3 of the second intervention device according to the invention;

FIG. 6 is a view analogous to FIG. 2 of a third intervention device according to the invention.

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A first fluid exploitation installation 10 according to the invention is illustrated in FIG. 1. This installation 10 comprises a fluid exploitation well 12 contained in the ground 18, a well head 14 obturating the well 12 at the surface 16 of the ground 18, and an intervention device 20 according to the invention for performing operations in the well 12.

The well 12 is made in the ground 18 in order to connect a layer of fluid to be exploited (not shown) located in depth in the ground 18 to a first point 22 located at the surface.

Conventionally the well 12 comprises an outer conduit 24 called a "casing" and an inner conduit 26 called "a production tube" for conveying the fluid from the layer up to the first point 22. The exploited fluid is for example a hydrocarbon such as petroleum or gas.

The well head 14 selectively obturates the conduits 24, 26 at the first surface point 22. It thus comprises a device 28 for obturating the well and, for introducing the intervention device 20 into the well 12, sealing means 30 and guide pulleys 32.

The intervention device 20 comprises a lower assembly 34 intended to be introduced into the conduits 24, 26 of the well 12, a cable working line 36 for deployment of the lower assembly 34 in the well 12, inserted into the well through the well head 14 and a winch 38 for maneuver the cable working line.

The lower assembly 34 is of a generally elongated shape. For example it bears tools for intervention in the well such as an anchor, a jar, an actuator, an explosive head, or further measurement tools such as sensors for measuring temperature or pressure in the well, sensors for measuring properties of the formation around the well, such as the natural radiation emitted by the formation.

In this example, the cable working line 36 is formed by a solid single-strand smooth cable, called "a piano wire", designated by the term of "slickline". This cable is made in a metal material, such as electroplated stainless steel (for example of the 316 type). This smooth cable has good resistance to pressure and adequate flexibility. Typically, this type of cable is made with a breaking strength of 300 daN to a 1,500 daN, preferably from 600 to 1,000 daN. It has a length of more than 5,000 meters generally comprised between 1,000 meters and 4,000 meters depending on the depth of the well. Certain very deep wells may attain 8,000 meters.

Alternatively, the cable is a stranded cable of the "braided line" or "electric line" type.

The cable working line 36 is unwound from the winch 38, and then passed around the return pulleys 32 before being introduced into the well through the sealing means 30. The lower assembly 34 is attached to the free end 40 of the line 36.

The winch 38 comprises a rotary drum 42 for winding up the line 38, a drum support 44 laid on the ground 18, and a hydraulic central unit 46 for actuating and controlling the rotary drum 42.

The drum 42 is rotatably mounted about a horizontal axis on the support 44. It comprises a substantially cylindrical outer surface for winding up the line 38.

The rotation of the drum 42 about its axis in a first direction winds the line 36 around the drum and displaces the lower assembly 34 towards the top of the well 12, while the rotation of the drum 42 about its axis in a second direction unwinds the line 38 out of the drum 42 and moves the lower assembly 34 towards the bottom of the well 12.

As illustrated by FIG. 2, the hydraulic central unit 36 comprises a tank 50 for storing a hydraulic drive fluid, a pump 52 for displacing the hydraulic fluid, connected to the tank 50, and a motor 56 for driving into rotation the drum 42 hydraulically connected to the pump 52 and to the tank 50 through a

selective distributor **58** allowing the motor **56** and the drum **42** to be driven into rotation in the first direction or in the second direction.

The central unit **46** further comprises means **60** for controlling the selective distributor **58** and, according to the invention, a regulator **62** of the hydraulic flow provided by the pump **52**, controlled depending on a pressure difference of the hydraulic drive fluid, which pressure difference depends on the load exerted on the motor **56** by the rotary drum **42**.

The tank **50** consists of a fluid reservoir **70** maintained at a pressure substantially equal to atmospheric pressure. The reservoir **70** contains a volume of hydraulic fluid greater than at least once the volume of fluid contained in the upstream conduit **54** and in the selective distributor **58**.

The pump **52** comprises an inlet **72** into which the upstream conduit **54** opens out, and an outlet **74** connected to the distributor **58**. It is for example driven by a diesel engine. The hydraulic fluid flow rate at the outlet **74** of the pump **52** is adjustable, this adjustment being carried out by means of the regulator **62** as this will be seen below.

The selective distributor **58** comprises a switching slide gate valve **76**, and, connected to the slide gate valve **76**, an outlet tubing **78** of a pump **52**, a first tubing **80** and a second tubing **82** for connecting to the motor **56**, and a tubing **84** for discharging towards the tank.

The slide gate valve **76** is for example a valve of the MV18 type from the German corporation BUCHER or a WM18 valve from LINDE.

The slide gate valve **76** comprises a valve body **86** having four inlets **88A** to **88D** respectively connected to the tubing **78** to **84**. It further comprises a mobile slide **90** in the valve body **86** having an upper hydraulic distribution stage **92** for circulating the hydraulic fluid in the motor **56** in a first direction, and a lower hydraulic distribution stage **94** for circulating the hydraulic fluid in the motor **56** in a second direction.

Each stage **92**, **94** comprises a feed segment **96** connecting the outlet tubing **78** of the pump and one of the first and second tubings **80** and **82**, and a discharge segment **98** connecting the other of the first and second tubings **80**, **82** with the tubing **84** for connecting to the tank.

The slide **90** is displaceable in the valve body **86** between a first activation position of the upper stage **92**, in which the upper stage **92** is placed facing the inlets **88A** to **88D** and a second activation position of the lower stage **94** in which the lower stage **94** is connected to the inlets **88A** to **88D**.

In the first activation position, the feed segment **96** of the upper stage **92** connects the outlet tubing **78** of the pump to the first tubing **80** in order to bring the fluid pumped by the pump through the outlet tubing **78** of the pump, the segment **96** and the first tubing **80** as far as a first inlet **100** of the motor **56** and to form an intermediate conduit between the outlet **74** of the pump and the first inlet **100** of the motor **56**.

In this position, the discharge segment **98** connects the second tubing **82** to the discharge tubing **84** in order to form a downstream conduit between the second inlet **102** of the motor **56** and the tank **50**.

In the first activation position, the lower stage **94** is placed away from the inlets **88A** to **88D** and is therefore inactive.

In the second activation position, the supply segment **96** of the lower stage **94** connects the outlet tubing **78** of the pump to the second tubing **82** in order to create the intermediate conduit between the outlet **74** of the pump and the second inlet **102** of the rotor.

Also, the discharge segment **98** connects the first tubing **80** to the discharge tubing **84** in order to create a downstream conduit extending between the first inlet **100** and the tank **50**.

In the second activation position, the upper stage **92** is placed away from the inlets **88A** to **88D** and is therefore inactive.

Thus, the displacement of the slide **90** between its first activation position and its second activation position controls the direction of circulation of the fluid in the motor **56** and therefore the direction of rotation of the drum **42**.

The discharge tubing **84** is provided with a filter **103** for the hydraulic fluid.

The control means **60** comprise means for controlling the slide **90** of the valve **76** in order to move it between its first activation position and its second activation position depending on the direction of rotation required on the drum **42**.

According to the invention, the regulator **62** controls the fluid flow rate at the outlet **74** of the pump **52** at any moment during the rotation of the motor **56**. This control is carried out depending on the load applied on the motor **56** by the drum **42** under the effect of the cable working line **36**.

For this purpose, as illustrated by FIG. 3, the regulator **62** comprises a calibrated throttle **150** for measuring the applied load, an assembly **152** for adjusting the flow rate of the pump **52**, and a servo-control assembly **154** for the adjustment assembly **152** in order to servo-control the flow rate at the outlet **74** of the pump **52** while maintaining a constant pressure difference at the ends of the throttle **150**.

The throttle **150** comprises a valve **157** having an orifice with a diameter adjustable by the control means **60**. The diameter of the orifice is advantageously smaller than the average diameter of the conduit on which the throttle is mounted.

In this example, the valve with an adjustable orifice **157** is placed in the slide gate valve **76** of the selective distributor **58**. Thus, for each stage **92** and **94**, a valve with an adjustable orifice **157** is mounted in series on the hydraulic fluid supply segment **96**. Consequently, a calibrated throttle **150** is mounted in series on the intermediate conduit connecting the outlet **74** of the pump **52** to an inlet **100**, **102** of the motor **56** regardless of the position of the slide **90** of the valve **76**.

As illustrated by FIG. 3, the throttle **150** further comprises an upstream tap **158** and a downstream tap **160** for taking the pressure upstream and downstream of the valve **157**, respectively. The tapings **158** and **160** open out into the segment **96** and are hydraulically connected to the servo-control assembly **154**, in order to servo-control the adjustment assembly **152** of the pump according to the pressure difference measured at the ends of the valve with an adjustable orifice **157**.

The adjustment assembly **152** and the servo-control assembly **154** are for example integrated within an HPR105-02 assembly from the German corporation LINDE.

The adjustment assembly **152** comprises a piston **160** for actuating the plate of the pump **52**, mounted so as to be mobile in a cylinder **164** delimiting a circulation chamber **166** of the piston **162**.

The piston **162** is displaceable in the chamber between a first end position, on the right in FIG. 3, in which the outlet flow rate of the pump **52** is maximum and a second end position, on the left in FIG. 3, in which the outlet flow rate of the pump is substantially zero.

The piston **162** sealably delimits in the chamber **166**, an upstream region **168** and a downstream region **170**. A spring **167** is interposed between the piston **162** and the wall of the cylinder **164** in the upstream region in order to urge the piston towards the first end position.

The upstream region **168** is connected to the outlet **74** of the pump through a tap **172** for setting pressure, so that the

pressure in the upstream region **168** is substantially equal to the pressure upstream from the valve with an adjustable orifice **157**.

The downstream region **170** is connected to the servo-control assembly **154** through a servo-control conduit **174**.

The servo-control assembly **154** comprises a slide gate regulator **180** which includes a regulator body **182** and a mobile slide **184** driven under the effect of the pressure difference received from the tappings **158**, **160**.

The regulator body **182** comprises three inlets, **186A** to **186C**. The first inlet **186A** is connected to the upstream tap **158** through a fork **188** for feeding fluid to the regulator **180** at a pressure substantially equal to the pressure taken upstream from the valve **157**.

The second inlet **186B** is connected to the tank **50** through a discharge tubing **190** for depressurisation of the regulator.

The third inlet **186C** is connected to the servo-control conduit **174** of the adjustment assembly **152**.

The slide **184** comprises a first stage **192** having a segment **194** for connecting the first inlet **186A** to the second inlet **186B**, and a second stage **196** having a segment **198** for connecting the second inlet **186B** to the third inlet **186C**.

The slide **184** is mobile in the valve body between a first control position for activating the first stage **192**, in which the servo-control conduit **174** is connected to the fork **188** for feeding this conduit **174** and the downstream region **170** with pressurized fluid, and a second control position for activating the second stage **196**, in which the servo-control conduit **174** is connected to the discharge tubing **190** by the segment **198** for discharging pressurized fluid contained in the downstream region **170** towards the tank **50**.

The displacement of the slide **184** between its control positions results from the application of the pressure in the upstream tap **158** on a surface of the slide **184** and from the application of the pressure present in the downstream tap **160** on a surface opposite to the slide **184**. This displacement is therefore controlled hydraulically.

The operation of the intervention device **20** according to the invention during an intervention within the first fluid exploitation installation **10** will now be described.

Initially, the winch **38** is brought to the vicinity of the well head **14**. The cable working line **36** is partly unwound so as to have it pass in the return pulleys **32**, and then through the sealing means **30**. The lower assembly **34**, bearing at least an intervention tool, is introduced through an airlock provided in the sealing means **30**. The tool **34** is then attached to the free end **40** of the cable working lines **36**.

Next, the operator of the intervention device **20** actuates the winch **38** in order to unwind the cable working line **36** out of the drum **42** and to have the tool **34** move downwards into the well.

For this purpose, he/she acts on the control means **60** in order to control the drum **42** rotation in a first direction with view to unwinding the line **36**.

Thus, the control means **60** control the switching slide gate valve **76** for displacing the slide **90** into its first activation position and to place the upper stage **92** facing the inlets **88A** to **88D**.

In this configuration, a closed hydraulic circuit, on which are mounted in series the pump **52** and the motor **56**, is formed between the upstream conduit, the pump **52**, the pump outlet tubing **78**, the feed segment **96** and the first tubing **80** for connecting to the motor as far as the first inlet **100** of the motor **56**. The hydraulic fluid pumped by the pump **52** then circulates in the motor **56** between the first inlet **100** and the second inlet **102** and is discharged towards the tank **50** through the

second tubing **82**, the discharge segment **98** and the tubing **84** for connecting to the tank passing through the filter **103**.

The fluid flow rate at the outlet **74** of the pump is automatically controlled by the regulator **62** depending on the diameter of the orifice of the valve **157**, for this purpose, when the load strongly increases on the motor **56**, the pressure difference on the terminals of the adjustable orifice valve **157** decreases and is sensed by the tappings **158**, **160**. This pressure difference is hydraulically transmitted to the control assembly **180** for controlling displacement of the slide **184** from its position for activating the first stage **192** towards its position for activating the second stage **196**.

When this difference is greater than an adjustable threshold value, for example 20 bars, the flow rate of the pump **52** has to be increased in order to maintain a constant pressure difference between the taps **158**, **160** at the ends of the adjustable orifice valve **157**. When the threshold value is exceeded, the hydraulic fluid present in the taps **158**, **160** displace the slide **182** towards its activation position of the second stage.

The servo-control conduit **174** is then connected to the tank **50** through the segment **198**. The pressurized fluid present in the downstream region **170** is then discharged towards the tank **50**, through the discharge tubing **190**, which reduces the volume of the downstream region **170**. The piston **162** is thereby displaced towards the first end position, thereby increasing the fluid flow rate at the outlet of the pump **52**.

On the contrary, when the pressure difference at the terminals of the adjustable orifice valve **157** increases beyond the threshold value, the slide **184** is displaced to the position for activating the first stage **192**, which causes connection of the fork **188** to the servo-control conduit **174**. The pressurized fluid present in the fork **188** is then introduced into the downstream region **170**, causing the displacement of the piston **162** towards its second end position and reduction in the output flow rate of the pump **52**.

Additionally, by adjusting the size of the calibrated orifice of the valve **157** with the control means **60** it is possible to adjust the controlled fluid flow rate circulating through the motor **56** in order to increase or decrease the speed of rotation of the drum **42**.

In order to move the line **30** up by winding it up around the drum **42**, the operator actuates the control means **60** for displacing the slide **90** of the valve **76** towards its second activation position, in which the lower stage **94** is connected to the inlets **88A-88D**.

In this configuration, the intermediate conduit connecting the outlet **74** of the pump to the motor **56** is formed through the outlet tubing **78** of the pump, and the second tubing **82** for connection to the motor, as far as the second inlet **102**. The downstream conduit for discharging the fluid is formed between the first inlet of the motor **100** and the tank **50** through the first tubing **80** and the tubing **84** for discharging towards the tank.

The combination of a significant volume of available hydraulic fluid and of a very reactive regulation by the regulator **62** allows a very rapid increase in the fluid flow rate at the outlet **74** of the pump **52** and thereby sufficient hydraulic power is made available for driving into rotation the motor **56** at great speed or when the load strongly increases on the drum **42**.

Moreover, when the motor **56** operates at slow speed, the control provided according to the load applied on the terminals of the throttle **156** by the regulator **62** provides accurate operation, independent of the load and controlled displacement of the winch **38** and therefore of the cable working line **36**.

The intervention device **20** according to the invention, as for the winches in open circuit, has high hydraulic power for very rapidly increasing the speed or the load applied on the cable working line **36**. It also gives the possibility of benefiting from accurate control of the hydraulic fluid flow rate passing through the motor **56** similar to that of a winch in a closed circuit when great accuracy on the control speed is required.

By means of the invention which has just been described, it is therefore possible to have an intervention device in a well comprising a lower assembly intended to be introduced into the well by means of a cable working line and a winch for maneuvering the line which operates in an accurate and stable way, with reduced consumption of energy.

The structure of the hydraulic circuit within the central unit may also easily be modulated in order to add auxiliary members for generating energy or other motors in parallel on the motor for driving the winch.

Thus, in a second device **220** according to the invention, a second motor, an electricity generator or a piston is mounted in parallel on the motor.

In the example illustrated in FIGS. **4** and **5**, the second device **220** comprises a piston **222** mounted so as to be mobile in a cylinder **224**.

The second device **220** also comprises a selective distributor **258** for controlling the piston which includes a switching slide gate valve **276**.

The selective distribution **258** comprises, connected to the slide gate valve **276**, an auxiliary pump outlet tubing **278** tapped on the outlet tubing **78**, a first auxiliary tubing **280** and a second auxiliary tubing **282** for connecting to the cylinder **224** and an auxiliary tubing **284** for connecting to the tank **50**, tapped on the tubing **84** for connecting to the tank upstream from the filter **103**.

The additional slide gate valve **276** is of a structure identical with that of the slide gate valve **76**. Thus, the components of this valve **276** are illustrated identically in FIG. **4** with the components of the valve **76**, with references beginning by the number **2**. This slide gate valve **276** will therefore not be described in detail.

The first auxiliary tubing **280** connects the inlet **288B** of the valve **276** to a first inlet **2100** of the cylinder **224** located on one side of the piston **222**. The second auxiliary tubing **282** connects the inlet **288C** of the valve **276** to a second inlet **2102** of the cylinder **244** located on another side of the piston **222** with respect to the first inlet **2100**.

Unlike the first device **10**, the control means **60** further comprise means for controlling the slide **290** of the slide gate valve **276** for displacing it between a first position for actuating the piston and a second position for actuating the piston, depending on the required direction of displacement on the piston **222**.

An auxiliary calibrated throttle **2150** for measuring the applied load on the piston **222**, is mounted in parallel on the calibrated throttle **150**. This calibrated throttle **2150** is located inside the slide gate valve **276** on the feed segment **296**.

This auxiliary calibrated throttle **2150** has a structure analogous to that of the calibrated throttle **150** and will not be described in detail below.

The throttle **150** and the auxiliary throttle **2150** are hydraulically connected to the servo-control assembly **154** via upstream tapplings **160**, **2160** which are connected together through a directional valve **226**.

The directional valve **226** is connected through a common upstream tapping **228** to the servo-control assembly **254**.

As in the first device **20**, the downstream tapping **158** remains tapped on the pump outlet tubing **78**, between the outlet **74** of the pump **52** and the tapping of the auxiliary pump outlet tubing **278**.

The directional valve **226** has a logic circuit for selecting at each instant between the upstream tapping **2160** and the auxiliary upstream tapping **160**, the one which has the highest pressure, and for transmitting this pressure to the servo-control assembly **154** via the common upstream tapping **228**.

The adjustment assembly **152** and the servo-control assembly **154** are moreover identical with those illustrated in FIG. **3**.

The operation of the second device **220** according to the invention for the remainder is analogous to that of the first device **20**.

A third device **320** according to the invention is illustrated in FIG. **6**. Unlike the first device **20**, the pump **52** delivers a constant output flow rate.

A bypass tubing **322**, provided with a control valve **324** delivering an adjustable flow, is tapped on the pump outlet tubing **78**. The bypass tubing **322** opens out into the tank **50** and is capable of diverting an adjustable fraction comprised between 0% and 100% of the output flow from the pump up to the tank **50**, and therefore to deliver to the motor an adjustable flow comprised between 100% and 0% of the constant flow from the pump.

Unlike the first device **20**, the regulator **62** of the third device **320** includes an assembly **152** for adjusting the flow passing through the valve **324**, this assembly **152** being controlled by the servo-control assembly **154**.

The control valve **324** is thus pressure-compensated. The regulator **62**, and the assembly **152** for adjusting the fluid flow rate delivered to the motor are controlled by the servo-control assembly **154** depending on a hydraulic fluid pressure depending on the load exerted on the motor, measured by the pressure difference at the terminals of the throttle **150** as described earlier.

The thereby obtained device **320** is much more stable depending on the load, which notably allows an increase in the accuracy of the displacement of the lower assembly **34** in the well.

The invention claimed is:

1. A device (**20**; **220**; **320**) for intervention in a fluid exploitation well (**12**), of the type comprising:
 - a lower assembly (**34**) bearing at least one intervention and/or measurement tool, intended to be introduced into the well (**12**);
 - a cable working line (**36**) bearing the lower assembly (**34**);
 - a winch (**38**) for maneuvering the line, the winch (**38**) comprising a rotary drum (**42**) for winding up the line (**36**) and a hydraulic central unit (**46**) for driving the drum (**42**) into rotation, the hydraulic central unit (**46**) including:
 - a tank (**50**) for storing a hydraulic control fluid;
 - a pump (**52**) for driving the hydraulic fluid, the pump being connected to the tank (**50**) through an upstream conduit (**54**);
 - at least one hydraulic motor (**56**) for driving the drum (**42**) connected to the pump (**52**) through an intermediate conduit and connected to the tank (**50**) through a downstream conduit;
 - wherein the hydraulic central unit comprises a regulator (**62**) for the hydraulic fluid flow delivered to said or each hydraulic motor (**56**), the regulator (**62**) being controlled according to at least one hydraulic fluid pressure depending on the load exerted on the motor (**56**) by the

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rotary drum (42), said or each pressure being directly taken on one of said conduits, and
 wherein the hydraulic central unit (46) comprises an adjustable calibrated throttle (150), mounted on the intermediate conduit, an upstream tap (158), and a downstream tap (160) for taking the pressure upstream and downstream from the throttle (150), the regulator (62) being servo-controlled for maintaining the pressure difference taken between the upstream and downstream taps (158, 160) to be substantially constant at an adjustable threshold value,
 wherein the regulator (62) comprises an assembly (152) for adjusting the flow rate of the pump (52) including a mobile member (162) between a minimum flow rate position and a maximum flow rate position,
 wherein the regulator (62) comprises an assembly (154) for servo-control of the mobile member (162) including a control valve (156) having a slide (184) displaceable between a first control position for the displacement of the mobile member (162) towards the maximum flow rate position and a second control position for the displacement of the mobile member (162) towards the minimum flow rate position, the upstream tap (158) and the downstream tap (160) being hydraulically connected to the control valve (156) for displacing the slide (184) between its control positions depending on the pressure difference between the upstream tap (158) and the downstream tap (160).
 2. The device (20; 220) according to claim 1, characterized in that the adjustment assembly (152) comprises an enclosure (164) delimiting a chamber (166) for receiving the mobile member (162), the mobile member (162) defining in the chamber (166) an upstream region (168) hydraulically connected to one of said conduits (96) and a downstream region (170) hydraulically connected to the control valve (156), the slide (184) in its first position being connected to the downstream region (170), for supplying the downstream region with pressurized hydraulic fluid, and in its second position hydraulically connecting the downstream region (170) to a low pressure tank (50).
 3. The device (320) according to claim 1, characterized in that it comprises a bypass tubing connecting the outlet of the pump to the tank, the regulator (62) comprising a valve for controlling the flow circulating through the bypass tubing.
 4. The device (20; 220; 320) according to claim 1, characterized in that the hydraulic central unit (46) comprises a

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switching valve (76) displaceable between a first activation position in which the intermediate conduit is formed between the outlet (74) of the pump (52) and a first inlet (100) of the motor (56), and the downstream conduit is formed between a second inlet (102) of the motor (56) and the tank (50), and a second activation position in which the intermediate conduit is formed between the second inlet (102) of the motor and the outlet (74) of the pump (52), and the downstream conduit connects the first inlet (100) of the motor and the tank (50).
 5. The device (20; 220; 320) according to claim 4, characterized in that the calibrated throttle (150) comprises a valve with an adjustable orifice (157) placed in the switching valve (76).
 6. The device (220) according to claim 1, characterized in that the hydraulic central unit (46) comprises a hydraulically driven member, connected to the pump (52) in parallel on the hydraulic motor (56).
 7. An installation (10) for exploiting fluid in the ground (18) characterized in that it comprises:
 an exploitation well (12) made in the ground (18), the well (12) opening out in a first point (22) located at the surface (16) of the ground;
 a well head (14) obturating the well (12) at the first point (22); and
 and an intervention device (20; 220; 320) according to claim 1, the lower assembly (34) and the working line (36) being introduced into the well (12) through the well head (14).
 8. A method for intervening in a well (12) with a device (20; 220; 320) according to claim 1, characterized in that it comprises the following steps:
 mounting the lower assembly (34) on the working line (36) and introducing the lower assembly (34) and the working line (36) into the well (12);
 actuating the hydraulic central unit (46) for driving the drum (42) into rotation, the actuation comprising:
 applying the pump (52) for driving the hydraulic motor (56) by circulating hydraulic fluid in said conduits, and controlling the flow delivered to said or each hydraulic motor according to at least one pressure depending on the load exerted on the motor (56) by the drum (42), said or each pressure being directly taken on one of said conduits.

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